

What is claimed is:

1. A safety seat comprising:
  - a. a unitary molded shell having a bottom portion and a back portion, the bottom and the back portions each having a seating surface and a non-seating surface opposite the seating surface; and
  - b. a safety restraint system integral to the shell,wherein the seating surfaces of the bottom and the back portions of the shell have flexible, resilient padding disposed thereon, the safety seat is fixedly attachable by a plurality of brackets to at least one structural member of a vehicle.
2. The safety seat according to claim 1, further comprising a headrest adjustably attachable to the safety seat, the headrest comprising a molded shell having flexible, resilient padding disposed on a portion thereof.
3. The safety seat according to claim 1, further comprising a plurality of attachment plates integral to the bottom portion and the back portion of the shell.
4. The safety seat according to claim 3, wherein the safety restraint system comprises a plurality of restraint straps, each strap having a first and a second end, the first end of each of the plurality of restraint straps being fastened to a corresponding plate of the plurality of attachment plates, the second end of each of the plurality of restraint straps having a connecting device integral thereto for releasably securing together the plurality of restraint straps.
5. The safety seat according to claim 3, wherein a headrest is adjustably attachable to the back portion of the shell by a connecting member, the connecting member having an upper portion fastened to the headrest and a lower portion fastened to one of the plurality of attachment plates.
6. The safety seat according to claim 1, wherein the safety restraint system is a five-point harness.

7. The safety seat according to claim 1, wherein the safety restraint system is a six-point harness.
8. The safety seat according to claim 1, wherein the padding is a resin.
9. The safety seat according to claim 8, wherein the resin is formed in a shape of a defined occupant of the safety seat such that that padding is customized for each occupant of the safety seat.
10. The safety seat according to claim 1, wherein the padding is sculpted foam.
11. The safety seat according to claim 1, wherein at least one secondary support member is attachable to the shell.
12. The safety seat according to claim 11, wherein the at least one secondary support member comprises a rib guard attachable to the back portion of the shell, the rib guard having a seating surface and a non-seating surface opposite the seating surface, a flexible, resilient padding being disposed on the seating surface.
13. The safety seat according to claim 11, wherein the at least one secondary support member comprises a leg rest attachable to the bottom portion of the shell, the leg rest extending forwardly and downwardly relative to the bottom portion.
14. The safety seat according to claim 1, wherein the back portion includes wings protruding generally perpendicularly from said back portion near a top end thereof.
15. The safety seat according to claim 14, further comprising a headrest adjustably attachable to the back portion of the shell, the headrest having extending members oriented generally parallel relative to the wings.
16. The safety seat according to claim 14, wherein linking members extend between and connect the wings and corresponding extending members.

17. The safety seat according to claim 1, wherein the shell comprises a laminate.
18. The safety seat according to claim 1, wherein the shell comprises an inner layer, and outer layer and a core disposed between the inner and outer layers.
19. The safety seat according to claim 18, wherein each of the inner and the outer layers each comprises a plurality of sheets of woven carbon fibers bonded together.
20. The safety seat according to claim 19, wherein the inner and the outer layers further comprise at least one sheet of KEVLAR® fiber material.
21. The safety seat according to claim 18, wherein the core comprises an aluminum hexel honeycomb-like material.
22. The safety seat according to claim 18, wherein the core is bonded to the inner and the outer layers by epoxy resin.
23. The safety seat according to claim 18, wherein a plurality of attachment plates are disposed intermediate the inner and the outer layers, the attachment plates used for securing at least said safety restraint system to the shell.
24. The safety seat according to claim 23, wherein the plurality of attachment plates are made of a structural material.
25. The safety seat according to claim 23, wherein the plurality of attachment plates are made of aluminum.
26. The safety seat according to claim 23, further comprising support plates disposed on the non-seating surface of the shell, the support plates attached to a portion of the plurality of attachment plates.

27. The safety seat according to claim 26, wherein the safety seat is attached to at least one structural member of a vehicle by a plurality of brackets extending between and fastened to the support plates and the at least one structural member.

28. In combination with a vehicle, a safety seat comprising

- a. a unitary molded shell having a bottom portion and a back portion, the bottom and the back portions each having a seating surface and a non-seating surface opposite the seating surface; and
- b. a safety restraint system integral to the shell,

wherein the seating surfaces of the bottom and the back portions of the shell have flexible, resilient padding disposed thereon, the safety seat being fixedly attachable by a plurality of brackets to at least one structural member of the vehicle, the vehicle being an automobile, a watercraft or an aircraft.

29. The combination according to claim 27, wherein the vehicle is a race car or truck.

30. The combination according to claim 29, wherein the at least one structural member comprises a roll cage within an operating compartment of the vehicle.

31. The combination according to claim 27, further comprising a headrest adjustably attachable to the safety seat, the headrest comprising a molded shell having flexible, resilient padding disposed on a portion thereof.

32. The combination according to claim 27, further comprising a plurality of attachment plates integral to the bottom portion and the back portion of the shell.

33. The combination according to claim 32, wherein the safety restraint system comprises a plurality of restraint straps, each strap having a first and a second end, the first end of each of the plurality of restraint straps being fastened to a corresponding plate of the plurality of attachment plates, the second end of each of the plurality of restraint straps having a connecting device integral thereto for releasably securing together the plurality of restraint straps.

34. The combination according to claim 33, wherein the safety restraint system is a five-point harness.
35. The combination according to claim 33, wherein the safety restraint system is a six-point harness.
36. The combination according to claim 27, wherein the padding is a resin formed in a shape of a defined occupant of the safety seat such that that padding is customized for the defined occupant.
37. The combination according to claim 27, wherein at least one secondary support member is attachable to the shell.
38. The combination according to claim 37, wherein the at least one secondary support member comprises a rib guard attachable to the back portion of the shell, the rib guard having a seating surface and a non-seating surface opposite the seating surface, a flexible, resilient padding being disposed on the seating surface.
39. The combination according to claim 37, wherein the at least one secondary support member comprises a leg rest attachable to the bottom portion of the shell, the leg rest extending forwardly and downwardly relative to the bottom portion.
40. The combination according to claim 27, wherein the shell comprises an inner layer, and outer layer and a core disposed between the inner and outer layers.
41. The combination according to claim 40, wherein each of the inner and the outer layers each comprises a plurality of sheets of woven carbon fibers bonded together.
42. The combination according to claim 41, wherein the inner and the outer layers further comprise at least one sheet of KEVLAR® fiber material.
43. The combination according to claim 40, wherein the core comprises an aluminum hexel honeycomb-like material.

44. The combination according to claim 40, wherein the core is bonded to the inner and the outer layers by epoxy resin.
45. The combination according to claim 40, wherein a plurality of attachment plates are disposed intermediate the inner and the outer layers, the attachment plates used for securing at least said safety restraint system to the shell.
46. The combination according to claim 45, wherein the plurality of attachment plates are made of a structural material.
47. The combination according to claim 46, wherein the plurality of attachment plates are made of aluminum.
48. A unitary molded shell for a safety seat, the molded shell comprising an inner layer, an outer layer, and a core positioned therebetween.
49. A molded shell according to claim 48, wherein the inner layer and the outer layer each comprises a plurality of sheets of woven carbon fibers, the plurality of sheets being bonded together.
50. A molded shell according to claim 49, further comprising at least one sheet of KEVLAR® fiber material disposed within each of the plurality of sheets of woven carbon fibers of the inner and the outer layers.
51. A molded shell according to claim 48, wherein the core comprises an aluminum hexel honeycomb-like material.
52. A molded shell according to claim 48, wherein the core is bonded to the inner layer and the outer layer by epoxy resin.

53. A molded shell according to claim 48, further comprising a plurality of plates disposed intermediate the inner layer and the outer layer, the plurality of plates providing attachment locations thereon.
54. A molded shell according to claim 53, wherein the plurality of plates is made of a structural material.
55. A molded shell according to claim 54, wherein the structural material is aluminum.
56. A molded shell according to claim 53, wherein each of the plurality of plates has a plurality of spaced holes extending therethrough to create defined attachment locations.
57. A molded shell according to claim 56, wherein the attachment holes are formed in the inner layer and the outer layer to correspond with the defined attachment locations.
58. A molded shell according to claim 49, wherein the plurality of sheets comprise eight sheets.
59. A molded shell according to claim 54, further comprising support plates disposed on an exterior surface of the outer layer opposite the attachment plates, the support plates being fastened thereto.
60. A molded shell according to claim 48, further comprising attachment locations for secondary support members.

61. A method of making a safety seat shell comprising a laminate having an inner layer, an outer layer and a core positioned therebetween, the steps comprising:

- providing a mold of the shell;
- forming the outer layer by
  - layering a plurality of sheets of woven carbon fibers and at least one sheet of resilient fiber material within the mold;
  - placing the mold into an autoclave, the autoclave operating at a predetermined pressure and temperature profile; and
  - removing mold from the autoclave;
- placing core material upon an inner surface of the outer layer;
- forming the inner layer on the core material by layering a plurality of sheets of woven carbon fibers and at least one sheet of resilient fiber material upon a side of the core material opposite the outer layer;
- closing the mold such that the outer layer, core material and inner layer are enclosed within the mold;
- enclosing the mold in a bag;
- establishing a vacuum within the bag;
- inserting the bag into the autoclave;
- maintaining the autoclave at a predetermined pressure and a defined temperature profile;
- removing the bag from the autoclave;
- removing the mold from bag; and
- releasing the shell from the mold.

62. The method of making a safety seat shell according to claim 61, further comprising the steps of:

- positioning a plurality of attachment plates at predetermined locations on the inner surface of the outer layer; and
- adhering said plurality of attachment plates to the inner surface of the outer layer, wherein the said steps are performed prior to placing the core material on the inner surface of the outer layer.

63. The method of making a safety seat shell according to claim 61, wherein the formation step of the outer layer includes the step of removing the outer layer from the mold after the mold is removed from the autoclave.

64. The method of making a safety seat shell according to claim 61, wherein the step of placing the core material on the inner surface of the outer layer includes the steps of:  
coating the inner surface of the outer layer with an epoxy resin;  
positioning one side of core material on the coated inner surface of the outer layer,  
the core material shaped to correspond to the inner surface of outer layer;  
and  
coating a second side of the core material with an epoxy resin, the second side  
being opposite the outer layer.

65. The method of making a safety seat shell according to claim 61, wherein the step of maintaining the autoclave at a predetermined pressure includes maintaining the autoclave at approximately 30 psig.

66. The method of making a safety seat shell according to claim 61, wherein the step of maintaining the autoclave at a defined temperature profile includes  
maintaining the autoclave at about 100 F for approximately 30 minutes;  
increasing the temperature to between about 190 F and about 240 F;  
maintaining the autoclave between about 190 F and 240 F for approximately 60  
minutes; and  
decreasing the temperature to ambient temperature.

67. The method of making a safety seat shell according to claim 61, wherein the step of maintaining the autoclave at a defined temperature profile includes  
maintaining the autoclave at about 100 F for approximately 30 minutes;  
increasing the temperature to between about 200 F and about 225 F;  
maintaining the autoclave at about 200 F to about 225 F for approximately 60  
minutes; and  
decreasing the temperature to ambient.

68. The method of making a safety seat shell according to claim 61, further comprising the step of smoothing surfaces of the shell after removal from the mold.

69. The method of making a safety seat shell according to claim 61, wherein the resilient fiber material is KEVLAR® fiber material.

70. A method for making a safety seat having a molded shell and a safety restraint system integral thereto, the steps comprising:

providing a molded shell having a plurality of attachment plates disposed therein, the shell having a seating surface and a non-seating surface opposite the seating surface, the plurality of attachment plates being disposed intermediate the seating surface and the non-seating surface;

securing the safety restraint system to the shell, the safety restraint system comprising a plurality of restraint straps, each of the plurality of restraint straps having a first end and a second end, the first end of each of the plurality of restraint straps being attached to a corresponding plate of the plurality of attachment plates, the second end of each of the plurality of restraint straps having a connecting device attached thereto for releasably securing together plurality of restraint straps;

installing padding material on the seating surface of the shell; and

extending a portion of the safety restraint system through the padding such that the padding material is intermediate the first end and the second end of each of the of the plurality of restraint straps.

71. A method of making a safety seat according to claim 70, wherein the step of securing the safety restraint system to the shell includes the step of fastening the first end of each of the plurality of restraint straps to a corresponding attachment plate by extending fasteners through each first end and into receptacles within the corresponding plate.

72. A method of making a safety seat according to claim 70, wherein the step of installing padding material comprises the steps of:

enclosing a malleable resin into a bag and sealing the bag to prevent spillage;  
contouring the resin by seating a defined occupant on the bag of resin, whereby one surface of the resin conforms to a shape presented by the defined occupant;  
establishing a vacuum within the bag;  
disengaging the defined occupant from the bag;  
curing the resin with the bag such that the resin maintains the contoured surface;  
removing the resin from the bag;  
removing excess resin from surfaces opposite the contoured surface;  
installing the resin upon the seating surface of the shell, the contoured surface left exposed; and  
creating openings within the resin such that a portion of the safety restraint system is extendible therethrough.

73. A method of making a safety seat according to claim 72, further comprising positioning the bag of resin upon the seating surface of the shell prior to the seating step and removing the bag of resin from the shell prior to removing the resin from the bag.

74. A method of making a safety seat according to claim 72, further comprising the step of adjusting the contoured surface of the resin following the installation step.

75. A method of making a safety seat according to claim 70, wherein the step of installing padding material comprises the steps of:

cutting contoured shapes within foam, the shapes conforming to the seating surface of the shell; and  
installing the contoured shapes on corresponding portions of the seating surface of the shell.

76. A method of making a safety seat according to claim 75, wherein the step of installing the contoured shapes comprises:

maintaining the shapes on the corresponding portions of the seating surface of the shell; and  
taping the shapes to the shell.

77. A method of making a safety seat according to claim 70, wherein the step of installing the padding upon the seating surface comprises adhering the padding to the seating surface of the shell.

78. A method of making a safety seat according to claim 70, further comprising the step of covering the padding after the installation step.

79. A method of making a safety seat according to claim 70, further comprising the steps of:

providing a molded headrest having padding disposed thereon;  
positioning the headrest at a top of the shell;  
fastening a connector plate to a back of the headrest, the connector plate extending beyond the headrest toward the shell;  
adjusting the headrest relative to the defined occupant; and  
fastening the connector plate to an attachment plate disposed on a back portion of the shell.

80. A method of making a safety seat according to claim 79, further comprising the steps of:

extending at least one linking member between the headrest and the shell; and  
attaching the at least one linking member to the headrest and the shell.

81. A method of making a safety seat according to claim 70, further comprising the steps of:

positioning support plates on the non-seating surface of the shell opposite a portion of the plurality of attachment plates; and  
fastening said support plates to each corresponding attachment plate.

82. A method of making a safety seat according to claim 81, including the step of fastening a plurality of brackets to at least one of the support plates.

83. A method of using a safety seat having a molded unitary shell and a safety restraint system integral to said shell, the method comprising:

providing a unitary molded shell having a safety restraint system integral thereto, the shell having a seating surface and a non-seating surface opposite the seating surface;

installing padding on the seating surface of the shell;

extending a portion of the safety restraint system through the padding;

seating a defined occupant on the padding disposed on the seating surface of the shell;

adjusting the safety restraint system to provide optimal securement of the defined occupant within the safety seat;

removing the defined occupant;

positioning the safety seat within a vehicle; and

securing the safety seat to at least one structural member of the vehicle.

84. A method of using the safety seat according to claim 83, further comprising the steps of:

attaching secondary support members to the shell and padding the secondary support members before the positioning step; and

adjusting the secondary support members to conform to the defined occupant.

85. A method of using the safety seat according to claim 83, wherein the securing step includes fastening at least one bracket to the non-seating surface of the shell, said at least one bracket extending between and connecting the shell to the at least one structural member of the vehicle.

86. A method of using the safety seat according to claim 83, wherein the adjustment step includes positioning shoulder restraint straps of the safety restraint system such that the shoulder straps are intermediate a head-and-neck support device and the shoulders of the defined occupant seated in the safety seat, the head-and-neck support device removably enclosing a neck portion of the defined occupant.

87. A method of using the safety seat according to claim 83, further comprising attaching a headrest to a top end of the shell and adjusting said headrest relative to the defined occupant.